MEMO Number TSR06
DATE: 2023-03-13
TO: Dr. LaBerge
FROM: UHDRTZ
SUBJECT: Progress report for March 2023

1 INTRODUCTION

This memo provides the progress report required by Capstone. This report covers February 26 to March 12.

2 COMPLETED WORK

We have bought and received the new hardware that is to be the primary device that controls all the major systems. Setup of the user experience using this new hardware has been streamlined so that the only inputs needed to set up the full functional system is a keyboard and mouse.

Additionally the implementation of audio playing has now been completed so that the input taken from the crank affects the direction and speed of the music played. User controls have also been added in the form of a hideable GUI to set different parameters including movement and changing of masks over the raw camera feed.

Thirdly is the beginning of the User Guide and its requirements so that the end users can use the full system. This has mainly been done with small updates in many different sections and not a full top down instruction guide.

3 WORK EXPECTED DURING NEXT PERIOD

Objectives that we aim to complete within the next period are as follows:

Update the GUI to have full control over parameters of the camera including Hue, Saturation, and Color. This is effectively the Effects section of the design.

Update and maintain the User Guide so that there is a baseline for end users to know how to interact with and understand the delivered product.

Lastly is the implementation of a Quality of Life update where the system can be cleared of bugs, problems, or issues that may have arisen in the development process. This will be in the form of removal of any hard coded sections within the code base and the inclusion of an internal state machine that controls selection of devices and required options for running the system.

4 ISSUES FROM PREVIOUS REPORTS

The team was able to 3D print a housing for the arduino which will help with robustness. Any further, more complex 3D printing will continue to be a challenge for our team.

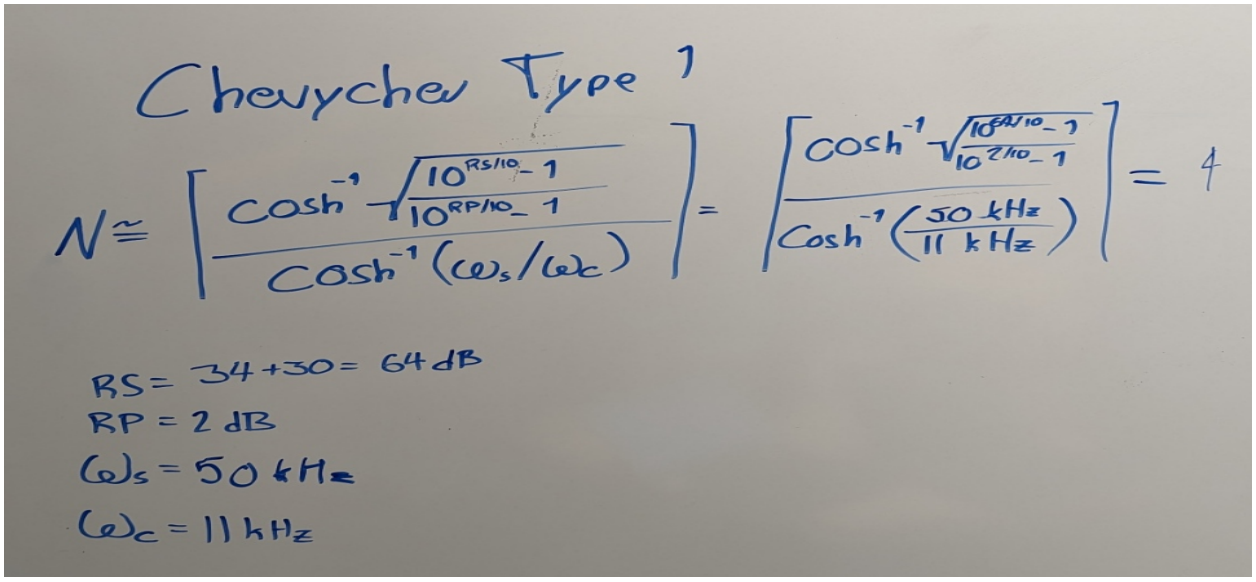
Haptics, camera controls within the GUI, and the overall user guide have been pushed back somewhat to fit with the current goals of optimizing, reformatting, and updating the major backend systems so that the majority of the specifications may be met before the things that rely on said systems. We will continue to move forward and work on whatever systems we can to get this fully releasable.

FILTER DESIGN

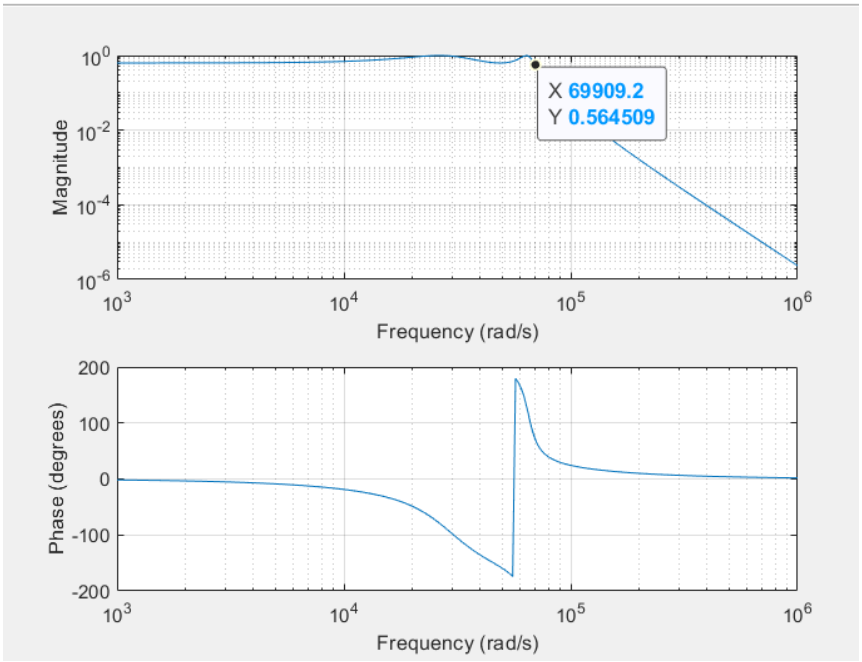
Consider a desired received signal with one-sided bandwidth of 11 kHz, that is subject to an interfering signal signal of bandwidth 300 Hz on an adjacent channel 50 kHz away. Signals within the 11 kHz passband must be within ±2 dB of the desired amplitude. The interfering signal may be 34 dB higher than the desired received signal. For the later digital processing to work correctly, the signal at the input to the processor must be 30 dB below the desired signal. Channels farther away from the desired signal may be at levels even higher than 34 dB, but the increase in level is less than 6 dB per octave. Design the analog filter that must precede the digital processing. Specify the type (Butterworth or Chebyshev Type I or Chebyshev Type II), the bandwidth, the stop band frequency, the number of poles and the necessary rejection. If you choose Chebyshev I or II, specify the allowable ripple. You may assume that the desired signal is centered at 0 Hz; that is, you need only design a low-pass filter to reject the adjacent channel.

The allowable ripple in the passband is +/- 2 dB.

Below is the math used to calculate the poles required for the first problem.



Below is the graph that confirms our findings to the required problem.


X 69909.2
Y 0.564509
Magnitude
Frequency (rad/s)
Phase (degrees)
Frequency (rad/s)